

§ 1066.635

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(1) To calculate \dot{Q} through one venturi or a combination of venturis, use the mean K_v you determined in §1066.625(c) and calculate the appropriate quantity for \dot{Q} as follows:

$$\dot{Q} = \frac{K_v \cdot p_{in}}{\sqrt{T_{in}}}$$

Eq. 1066.630-7

Where:

K_v = flow meter calibration coefficient.

T_{in} = temperature at the venturi inlet.

p_{in} = absolute static pressure at the venturi inlet.

Example:

$$K_v = 0.074954 \text{ m}^3 \cdot \text{K}^{0.5} / (\text{kPa} \cdot \text{s})$$

$$p_{in} = 99.654 \text{ kPa}$$

$$T_{in} = 353.15 \text{ K}$$

$$\dot{Q} = \frac{0.074954 \cdot 99.654}{\sqrt{353.15}}$$

$$\dot{Q} = 0.39748 \text{ m}^3/\text{s}$$

(2) [Reserved]

§ 1066.635 NMOG determination.

For vehicles subject to an NMOG standard, determine NMOG as described in paragraph (a) of this section. Except as specified in the standard-setting part, you may alternatively calculate NMOG results based on measured NMHC emissions as described in paragraphs (c) through (f) of this section.

(a) Determine NMOG by independently measuring alcohols and carbonyls as described in 40 CFR 1065.805 and 1065.845. Use good engineering judgment to determine which alcohols and carbonyls you need to measure. This would typically require you to measure all alcohols and carbonyls that you expect to contribute 1% or more of total NMOG. Calculate the mass of NMOG in the exhaust, m_{NMOG} , with the following equation, using density values specified in §1066.1005(f):

$$m_{\text{NMOG}} = m_{\text{NMHC}} - \rho_{\text{NMHC}} \cdot \sum_{i=1}^N \frac{m_{\text{OHC}i}}{\rho_{\text{OHC}i}} \cdot RF_{\text{OHC}i[\text{THC-FID}]} + \sum_{i=1}^N m_{\text{OHC}i}$$

Eq. 1066.635-1

Where:

m_{NMHC} = the mass of NMHC and all oxygenated hydrocarbons (OHCs) in the exhaust, as determined using Eq. 1066.605-1. Calculate NMHC mass based on ρ_{NMHC} .

ρ_{NMHC} = the effective C₁-equivalent density of NMHC as specified in §1066.1005(f).

$m_{\text{OHC}i}$ = the mass of oxygenated species i in the exhaust calculated using Eq. 1066.605-1.

$\rho_{\text{OHC}i}$ = the C₁-equivalent density of oxygenated species i .

$RF_{\text{OHC}i[\text{THC-FID}]}$ = the response factor of a THC-FID to oxygenated species i relative to propane on a C₁-equivalent basis as determined in 40 CFR 1065.845.

(b) The following example shows how to determine NMOG as described in

paragraph (a) of this section for (OHC) compounds including ethanol (C₂H₅OH), methanol (CH₃OH), acetaldehyde (C₂H₄O), and formaldehyde (CH₂O) as C₁-equivalent concentrations:

$m_{\text{NMHC}} = 0.0125 \text{ g}$
 $m_{\text{CH}_3\text{OH}} = 0.0002 \text{ g}$
 $m_{\text{C}_2\text{H}_5\text{OH}} = 0.0009 \text{ g}$
 $m_{\text{CH}_2\text{O}} = 0.0001 \text{ g}$
 $m_{\text{C}_2\text{H}_4\text{O}} = 0.00005 \text{ g}$
 $RF_{\text{CH}_3\text{OH}[\text{THC-FID}]} = 0.63$
 $RF_{\text{C}_2\text{H}_5\text{OH}[\text{THC-FID}]} = 0.75$
 $RF_{\text{CH}_2\text{O}[\text{THC-FID}]} = 0.00$
 $RF_{\text{C}_2\text{H}_4\text{O}[\text{THC-FID}]} = 0.50$
 $\rho_{\text{NMHC-liq}} = 576.816 \text{ g/m}^3$
 $\rho_{\text{CH}_3\text{OH}} = 1332.02 \text{ g/m}^3$
 $\rho_{\text{C}_2\text{H}_5\text{OH}} = 957.559 \text{ g/m}^3$
 $\rho_{\text{CH}_2\text{O}} = 1248.21 \text{ g/m}^3$
 $\rho_{\text{C}_2\text{H}_4\text{O}} = 915.658 \text{ g/m}^3$

$$m_{\text{NMOG}} = 0.0125 - 576.816 \cdot \left(\frac{0.0002}{1332.02} \cdot 0.63 + \frac{0.0009}{957.559} \cdot 0.75 + \frac{0.0001}{1248.21} \cdot 0.00 + \frac{0.00005}{915.658} \cdot 0.5 \right) + 0.0002 + 0.0009 + 0.0001 + 0.00005$$

$$m_{\text{NMOG}} = 0.013273$$

(c) For ethanol-gasoline blends with less than 25% ethanol by volume, you may calculate NMOG from measured NMHC emissions as follows:

(1) For hot-start and hot-running test cycles or intervals other than the FTP, you may determine NMOG based on the NMHC emission rate using the following equation:

$$e_{\text{NMOGh}} = e_{\text{NMHC h}} \cdot 1.03$$

Eq. 1066.635-2

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Where:

e_{NMOGh} = mass emission rate of NMOG from the hot-running test cycle.

e_{NMHC_h} = mass emission rate of NMHC from the hot-running test cycle, calculated using $\rho_{\text{NMHC-liq}}$.

Example:

$e_{\text{NMHC}_h} = 0.025 \text{ g/mi}$

$e_{\text{NMOGh}} = 0.025 \cdot 1.03 = 0.026 \text{ g/mi}$

(2) You may determine weighted composite NMOG for FTP testing based on the weighted composite NMHC emission rate and the volume percent of ethanol in the fuel using the following equation:

$$e_{\text{NMOGcomp}} = e_{\text{NMHCcomp}} \cdot (1.0302 + 0.0071 \cdot VP_{\text{EtOH}})$$

Eq. 1066.635-3

Where:

e_{NMOGcomp} = weighted FTP composite mass emission rate of NMOG.

e_{NMHCcomp} = weighted FTP composite mass emission rate of NMHC, calculated using $\rho_{\text{NMHC-liq}}$.

VP_{EtOH} = volume percentage of ethanol in the test fuel. Use good engineering judgment to determine this value either as specified in 40 CFR 1065.710 or based on blending volumes, taking into account any denaturant.

Example:

$e_{\text{NMHCcomp}} = 0.025 \text{ g/mi}$

$VP_{\text{EtOH}} = 10.1\%$

$e_{\text{NMOGcomp}} = 0.025 \cdot (1.0302 + 0.0071 \cdot 10.1) = 0.0275 \text{ g/mi}$

(3) You may determine NMOG for the transient portion of the FTP cold-start test for use in fuel economy and CREE calculations based on the NMHC emission rate for the test interval and the volume percent of ethanol in the fuel using the following equation:

$$e_{\text{NMOG-FTPct}} = e_{\text{NMHC-FTPct}} \cdot (1.0246 + 0.0079 \cdot VP_{\text{EtOH}})$$

Eq. 1066.635-4

Where:

$e_{\text{NMOG-FTPct}}$ = mass emission rate of NMOG from the transient portion of the FTP cold-start test (generally known as bag 1).

$e_{\text{NMHC-FTPct}}$ = mass emission rate of NMHC from the transient portion of the FTP cold-start test (bag 1), calculated using $\rho_{\text{NMHC-liq}}$.

Example:

$e_{\text{NMHC-FTPct}} = 0.052 \text{ g/mi}$

$VP_{\text{EtOH}} = 10.1\%$

$e_{\text{NMOG-FTPct}} = 0.052 \cdot (1.0246 + 0.0079 \cdot 10.1) = 0.0574 \text{ g/mi}$

(4) You may determine NMOG for the stabilized portion of the FTP test for either the cold-start test or the hot-start test (bag 2 or bag 4) for use in fuel economy and CREE calculations based on the corresponding NMHC emission rate and the volume percent of ethanol in the fuel using the following equation:

$$e_{\text{NMOG-FTPcs-hs}} = e_{\text{NMHC-FTPcs-hs}} \cdot (1.1135 + 0.001 \cdot VP_{\text{EtOH}})$$

Eq. 1066.635-5

Where:

$e_{\text{NMOG-FTPcs-hs}}$ = mass emission rate of NMOG from the stabilized portion of the FTP test (bag 2 or bag 4).

$e_{\text{NMHC-FTPcs-hs}}$ = mass emission rate of NMHC from the stabilized portion of the FTP test (bag 2 or bag 4), calculated using $\rho_{\text{NMHC-liq}}$.

(5) You may determine NMOG for the transient portion of the FTP hot-start test for use in fuel economy and CREE calculations based on the NMHC emission rate for the test interval and the volume percent of ethanol in the fuel using the following equation:

$$e_{\text{NMOG-FTPht}} = e_{\text{NMHC-FTPht}} \cdot (1.0195 + 0.0031 \cdot VP_{\text{EtOH}})$$

Eq. 1066.635-6

Where:

$e_{\text{NMOG-FTPht}}$ = mass emission rate of NMOG from the transient portion of the FTP hot-start test (bag 3).

$e_{\text{NMHC-FTPht}}$ = mass emission rate of NMHC from the transient portion of the FTP hot-start test (bag 3), calculated using $\rho_{\text{NMHC-liq}}$.

(d) You may take the following alternative steps when determining fuel economy and CREE under 40 CFR part 600 for testing with ethanol-gasoline blends that have up to 25% ethanol by volume:

(1) Calculate NMOG by test interval using Eq. 1066.635-3 for individual bag measurements from the FTP.

(2) For HEVs, calculate NMOG for two-bag FTPs using Eq. 1066.635-3 as described in 40 CFR 600.114.

(e) We consider NMOG values for diesel-fueled vehicles, CNG-fueled vehicles, LNG-fueled vehicles, and LPG-fueled vehicles to be equivalent to NMHC emission values for all test cycles.

(f) For all fuels not covered by paragraphs (c) and (e) of this section, manufacturers may propose a methodology to calculate NMOG results from measured NMHC emissions. We will approve adjustments based on comparative testing that demonstrates how to properly represent NMOG based on measured NMHC emissions.

§ 1066.695 Data requirements.

Record information for each test as follows:

(a) Test number.

(b) A brief description of the test vehicle (or other system/device tested).

(c) Date and time of day for each part of the test sequence.

(d) Test results. Also include a validation of driver accuracy as described in § 1066.425(j).

(e) Driver and equipment operators.

(f) Vehicle information as applicable, including identification number, model year, applicable emission standards (including bin standards or family emission limits, as applicable), vehicle model, vehicle class, test group, durability group, engine family, evaporative/refueling emission family, basic engine description (including displacement, number of cylinders, turbocharger/supercharger used, and catalyst type), fuel system (type of fuel injection and fuel tank capacity and location), engine code, GVWR, applicable test weight, inertia weight class, actual curb weight at zero miles, actual road load at 50 mph, transmission class and configuration, axle ratio, odometer reading, idle rpm, and measured drive wheel tire pressure.

(g) Dynamometer identification, inertia weight setting, indicated power absorption setting, and records to verify compliance with the driving distance and cycle-validation criteria as calculated from measured roll or shaft revolutions.

(h) Analyzer bench identification, analyzer ranges, recordings of analyzer output during zero, span, and sample readings.

(i) Associate the following information with the test record: test number, date, vehicle identification, vehicle and equipment operators, and identification of the measurements recorded.